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PLASTER SETTING RETARDER

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No Drawing. Continuation-in-part of applications Ser. No. 673,986, Oct. 9, 1967, and Ser. No. 868,931, Oct. 23, 1969. This application Mar. 9, 1970, Ser. No. 17,957
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ABSTRACT OF THE DISCLOSURE

Set retarding agents and systems for plaster including: polycarboxylic acids, particularly 1,3,5-pentane tricarboxylic acid; low molecular weight polyamine reaction products thereof; combinations of these with a chelating or coordination agent; and/or combinations of any of the above with boric acid or borax.

This application is a continuation-in-part of application Ser. No. 673,986, filed Oct. 9, 1967 and of application Ser. No. 868,931, filed Oct. 23, 1969, both now abandoned.

This invention relates to set retarders for plaster, cement and stucco, to compositions containing the same and to processes for using both.

It is known that it is desirable to provide plaster compositions that will set only after a given, predetermined period of time and will, after such time lapse, set rapidly. Similarly, it is desirable to accomplish this same purpose with stucco, cement and mortar.

It is further known to provide such desired retardation in calcined gypsum plaster by incorporating into the plaster composition certain proteinaceous materials. In the past, it has been found desirable to utilize as the retarder hydrolyzed proteinaceous material. This material has been made by the alkaline hydrolysis of certain naturally occurring materials such as hoof meal, feathers, animal furs and the like. These classes of materials are generally categorized as keratin type proteins. The alkaline hydrolysis of these materials is usually carried out with hot sodium or potassium hydroxide and sometimes with calcium hydroxide or with mixtures thereof.

It should be appreciated that it is not particularly desirable to utilize strong alkali or, for that matter, strong acid in the production of components of plaster since residual quantities of these very strong chemicals which become incorporated in the plaster may damage or weaken the lathing upon which the plaster is applied, the paper sheets as used in the manufacture of wall board and finally the tensile strength of the plaster itself. Further, when the set plaster is exposed to water as for the instance where the plaster is directly exposed to the elements, i.e. rain and/or snow, leaching of the alkali occurs producing discoloration and/or corrosion, etc. Still further, since the proteinaceous materials subjected to hydrolysis are natural in origin, it is difficult if not impossible to provide a hydrolysis product which is substantially uniform or a hydrolysis process which can be operated substantially continuously as is desirable in most chemical operations.

Thus, in the past, production of plaster setting retarders has been an art rather than a science since each batch required special attention during processing due to nonuniformity of raw materials. Further, each batch had to be subjected to extensive testing to determine its effectiveness as a plaster setting retarder and, where needed, it was often necessary to blend batches to produce a final

product which even came close to having substantially uniform properties.

It is, therefore, an object of this invention to provide a novel type of plaster setting retarder.

It is another object of this invention to provide a novel use for a particular class of compounds.

It is a further object of this invention to provide a class of plaster setting retarders that are more advantageous than the prior art hydrolyzed proteinaceous materials.

Other and additional objects of this invention will become apparent from a consideration of this entire specification including the claims hereof.

In accord with and fulfilling these objects, one aspect of this invention resides in the use of medium and long chain polycarboxylic acids as setting retarders for plaster and similar materials.

According to one aspect of this invention, aliphatic polycarboxylic acids are those containing at least two (2) carboxyl groups or their equivalents and preferably up to about four (4) carboxyl groups attached to an aliphatic backbone. The acids may be used in their free form, but in those instances where the free acids are water insoluble, it is preferred to use the acids in the form of their water soluble ammonium alkali or alkaline earth metal salts and preferably in the form of their potassium salts. In this salt form the insoluble acids are more readily distributed throughout the mixture to be made. In addition to the use of the acids in the free form, or in the form of salts, the acids may be used in anhydride form, as desired, when incorporated into a dry plaster composition. It is necessary, however, that this salt, anhydride or free acid form should be such that when the plaster composition is mixed with water, as is usual just before it is applied to an appropriate lathing, or in the manufacture of wall board, etc. that the free acid will be available in the composition to exert its set-retarding effect.

It is preferred in the practice of this invention to utilize polycarboxylic acids having carbon backbones having at least about (6) carbon atoms in straight or branched chain configuration. It is possible to utilize such acids which have other pendant groups, such as hydroxy, mercapto, amino and amido groups and the like. Thus, it is possible to use oxidized sugars and similar materials within the scope of this invention.

It has been found most desirable to utilize polycarboxylic acids which have terminal carboxyl groups such as pimelic acid, azelaic acid, 1,3,5-pentanetricarboxylic acid, 1,3,3,5-pentanetetracarboxylic acid, etc. Although the entire group of aliphatic polycarboxylic acids as defined above shows effectiveness in use as plaster setting retarder, it has been found that in general the dicarboxylic acids having an even number of carbon atoms are somewhat superior to dicarboxylic acids having an odd number of carbon atoms. On the other hand, citric acid and 1,3,5-pentanetricarboxylic acid, particularly the latter, have shown excellent results. In fact, 1,3,5-pentanetricarboxylic acid has proved to be about 25 times more effective as a setting retarder than the presently commercially used keratin material made by alkaline hydrolysis of naturally occurring animal substances.

The preferred retarders according to this invention, named in their free acid form, include pimelic, axelaic, 1,2,3-propanetricarboxylic and 1,3,5-pentanetricarboxylic acids. The most preferred acid is 1,3,5-pentanetricarboxylic acid.

It will be appreciated that, armed with the information that these referred to polycarboxylic acids and their salts are effective plaster setting retarders, it will be simple for one skilled in the art to decide which acid to use and what amount of acid to use depending upon the de-